

Applicants traverse the rejection because the combined teachings of these references fail to teach or suggest all of the features recited in the rejected claims. For example, the references, analyzed individually or in combination, fail to teach or suggest a plasma generation apparatus wherein "said magnetic force lines that pass through a center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 1.

Kisakibaru merely teaches that plasma is produced between parallel plate electrodes 7c and 7d and, in the absence of a magnetic field, is allowed to be distributed only between those parallel plate electrodes. (Col. 7, lines 12-14) Therefore, in reference to Figs. 8-9, Kisakibaru teaches that, in the absence of the magnetic field 31, the plasma region is allowed to be distributed as indicated by 6a. Subsequently, the substrate 4 is treated. Additionally, Kisakibaru teaches that in the presence of the magnetic field 31, the plasma region is expanded as indicated by 6b to allow the inner walls of the treatment chamber to be cleaned.

However, the electromagnetic coil 2, which induces the magnetic field 31, extends outwardly circumferentially along and apart from the peripheral side of the two walls as electrically conducting electrodes 7c and 7d. Therefore, the magnetic force lines 31 extending to the inner portion 6a between the plate electrodes 7c and 7d intersect the plate electrodes 7c and 7d. This is because the magnetic force lines 31 illustrated in Fig. 8 also extend in the direction perpendicular to the surface of the drawing sheet, i.e., coming out of the paper. Therefore, the magnetic force lines 31 intersect the plane electrodes 7c and 7d. Thus, Kisakibaru merely teaches an apparatus in which magnetic force lines intersect the electrodes 7c and 7d.

Therefore, Kusakibaru does not teach or suggest a plasma generation apparatus in which magnetic force lines that have passed through a center of the plasma generation region are shaped so that they do not intersect the two walls.

Saito does not remedy this deficiency of Kusakibaru. For example, Saito merely teaches a mechanism of plasma generation wherein a cylindrical means is used for applying power for discharge. Additionally, Saito merely teaches that magnetic force lines intersect the guide member (upper wall of the plasma processing region) and allow the high-energy electrons in the plasma region to flow out so as to cause the plasma density to be extremely low. (Fig. 9, item 15) Therefore, Saito fails to teach a plasma generation apparatus in which magnetic force lines that pass through a center of the plasma generation region are shaped so that they do not intersect the two walls.

Similarly, Watanabe merely teaches a carbon film producing method which can produce carbon films having desired characteristics. (Col. 1, lines 41-43) In Watanabe, a carbon film producing method is used to produce carbon films at a relatively low temperature. (Col. 1, lines 45-46) Therefore, Watanabe merely teaches a carbon film producing method utilizing a reactive sputtering process for projecting carbon particles from a graphite target electrode to deposit a very thin layer on a substrate. As a result, Watanabe fails to teach or suggest the shaping of magnetic force lines as recited in claim 1.

Additionally, Nakayama merely teaches a method for forming a silicone film of high adhesion capability through a reduced number of steps. (Col. 1, lines 52-54) Nakayama also teaches a method of forming a silicone film, comprising the steps of coating a solution for forming a silicone film on a substrate and drying the coated solution at a temperature below 150°C to form a silicone film on the substrate, treating the silicone film in a plasma produced from a gas mainly composed of oxygen, and heating the plasma silicone film at a temperature

of at least 150°C. (Col. 1, lines 56-63) However, Nakayama fails to teach or suggest the shaping of magnetic force lines.

Therefore, the combined teachings of the references fail to teach or suggest a plasma generation apparatus wherein "said magnetic force lines that have passed through a center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 1. Therefore, claim 1 is patentable over the combined teachings of Kisakibaru in view of Watanabe, Nakayama and Saito. Likewise, claims 2, 4 and 6, which depend from claim 1, are also patentable over the teachings of Kisakibaru in view of Watanabe, Nakayama and Saito.

B. Applicants Traverse the Rejection of Claim 3 Under  
35 U.S.C. §103(a) Over Kisakibaru and Asamaki et al.

The Office Action rejected claim 3 under 35 U.S.C. §103(a) as being unpatentable over Kisakibaru in view of Asamaki et al. (U.S. Patent No. 4,950,956, hereinafter "Asamaki"). Applicants traverse the rejection because the combined teachings of Kisakibaru and Asamaki fail to teach all of the features claimed in the rejected claims.

For example, as discussed above, Kisakibaru fails to teach a plasma generation apparatus wherein the magnetic force lines that pass through a center of the plasma generation region are shaped so that they do not intersect the two walls. Asamaki does not remedy the deficiency in Kisakibaru because Asamaki merely teaches on the subject of high-frequency electric power application means. Therefore, the combined teachings of Kisakibaru and Asamaki fail to teach or suggest a plasma generation apparatus in which "said magnetic force lines that pass through center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 1. Thus, claim 3 is patentable over the combined teachings of Kisakibaru and Asamaki.

C. Applicants Traverse the Rejection Under  
35 U.S.C. §103(a) of Claim 5 Over Kisakibaru and Obinata

The Office Action rejected claim 5 under 35 U.S.C. §103(a) as being unpatentable over Kisakibaru in view of Obinata (U.S. Patent No. 4,624,767). Applicants traverse the rejection because, as discussed above, Kisakibaru fails to teach or suggest all of the claimed features of the rejected claims and Obinata does not remedy the deficiency of Kisakibaru.

For example, as discussed above, Kisakibaru fails to teach a plasma generation apparatus wherein the magnetic force lines that pass through a center of the plasma generation region are shaped so that they do not intersect the two walls. Obinata does not remedy the deficiency in Kisakibaru because Obinata merely teaches a second electronically floating electrode and magnet means. Therefore, the combined teachings of Kisakibaru and Obinata fail to teach or suggest a plasma generation apparatus in which "said magnetic force lines that pass through center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 5 by virtue of its dependency on claim 1. Thus, claim 5 is patentable over the combined teachings of Kisakibaru and Obinata.

D. Applicants Traverse the Rejection Under  
35 U.S.C. §103(a) of Claim 7 Over Kisakibaru and Nakayama

The Office Action rejected claim 7 under 35 U.S.C. §103(a) as being unpatentable over Kisakibaru in view of Nakayama (U.S. Patent No. 4,894,254). Applicants traverse the rejection because, as explained above, the combined teachings of Kisakibaru and Nakayama fail to teach or suggest a plasma generation apparatus in which "said magnetic force lines that pass through center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 1. Therefore, claim 7, which depends from claim 1, is patentable over the combined teachings of Kisakibaru and Nakayama.

E. Applicants Traverse the Rejection Under 35 U.S.C. §103(a) of Claim 8 Over Kisakibaru in view of Oechsner and Nakayama

The Office Action rejected claim 8 under 35 U.S.C. §103(a) as being unpatentable over Kisakibaru in view of Oechsner (U.S. Patent No. 5,017,835) and Nakayama. Applicants traverse the rejection because, as discussed above, Kisakibaru fails to teach or suggest all of the claimed features of the rejected claims and the combined teachings of Obinata and Nakayama do not remedy the deficiency of Kisakibaru. For example, as discussed above, Kisakibaru fails to teach a plasma generation apparatus wherein the magnetic force lines that pass through a center of the plasma generation region are shaped so that they do not intersect the two walls. Oechsner and Nakayama do not remedy this deficiency.

For example, Oechsner merely teaches a high-frequency ion source for the production of an ion beam using electron cyclone resonance which has a tubular vessel whose shape matches the desired shape of the beam. As explained above, Nakayama merely teaches a method for forming a silicone film of high adhesion capability through a reduced number of steps. Therefore, the combined teachings of Kisakibaru in view of Oechsner and Nakayama fail to teach or suggest a plasma generation apparatus in which "said magnetic force lines that pass through center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 1. Thus, claim 8, which depends from claim 1, is patentable over the combined teachings of Kisakibaru in view of Oechsner and Nakayama.

F. Applicants Traverse the Rejection Under 35 U.S.C. §103(a) of Claim 9-12 Over Kisakibaru and Kinoshita et al.

The Office Action rejected claims 9-12 under 35 U.S.C. §103(a) as being unpatentable over Kisakibaru in view of Kinoshita et al. (U.S. Patent No. 5,795,452, hereinafter "Kinoshita"). Applicants traverse the rejection because the combined teachings of the references fail to provide all the claimed features.

For example, as explained above, Kisakibaru fails to teach or suggest a plasma generation apparatus wherein the magnetic force lines that pass through a center of the plasma generation region are shaped so that they do not intersect the two walls. Kinoshita does not remedy this deficiency. The teachings of Kinoshita are limited to the utilization of a plurality of magnetron discharge electrodes. Therefore, the combined teachings of Kisakibaru and Kinoshita fail to teach or suggest a plasma generation apparatus in which "said magnetic force lines that pass through center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 1. Thus, claims 9-12, which depend from claim 1, are patentable over the combined teachings of Kisakibaru and Kinoshita.

G. Applicants Traverse the Rejection Under 35 U.S.C. §103(a) of Claim 14 Over Kisakibaru in view of Smesny et al. and Saito

The Office Action rejected claim 14 under 35 U.S.C. §103(a) as being unpatentable over Kisakibaru in view of Smesny et al. (U.S. Patent No. 5,444,637, hereinafter "Smesny") and Saito. Applicants traverse the rejection because, as discussed above, the combined teachings of Kisakibaru and Saito fail to teach or suggest a plasma generation apparatus wherein the magnetic force lines that pass through a center of the plasma generation region are shaped so that they do not intersect the two walls. Smesny does not remedy this deficiency because Smesny merely teaches a position adjustment means for adjusting an electrically conductive wall electrode.

Therefore, the combined teachings of these references fail to teach or suggest a plasma generation apparatus in which "said magnetic force lines that pass through center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 14, by virtue of its dependency on claim 1. Thus, claim 14 is patentable.

H. Applicants Traverse the Rejection Under 35 U.S.C. §103(a)  
of Claim 15 Over Kisakibaru and Inazawa et al.

The Office Action rejected claim 15 under 35 U.S.C. §103(a) as being unpatentable over Kisakibaru in view of Inazawa et al. (U.S. Patent No. 5,595,627, hereinafter "Inazawa"). Applicants traverse the rejection because, as discussed above, Kisakibaru fails to teach or suggest all of the claimed features of the rejected claims and Inazawa does not remedy the deficiency of Kisakibaru. For example, as discussed above, Kisakibaru fails to teach a plasma generation apparatus wherein the magnetic force lines that pass through a center of the plasma generation region are shaped so that they do not intersect the two walls. Inazawa does not remedy the deficiency in Kisakibaru because Inazawa merely teaches optimization techniques for increasing etching selection ratios.

Therefore, the combined teachings of Kisakibaru and Inazawa fail to teach or suggest a plasma generation apparatus in which "said magnetic force lines that pass through center of said plasma generation region are shaped so that they do not intersect said two walls" as recited in claim 1. Thus, claim 15, by virtue of its dependence from claim 1, is patentable over the combined teachings of Kisakibaru and Inazawa.

I. Applicants Traverse the Rejection Under 35 U.S.C. §103(a)  
of Claim 16 Over Watanabe and Nakayama

The Office Action rejected claim 16 under 35 U.S.C. §103(a) as being unpatentable over Watanabe in view of Nakayama. Applicants traverse the rejection because the combined teachings of Watanabe and Nakayama fail to teach or suggest all of the claimed features of the rejected claim. For example, the combined teachings of Watanabe and Nakayama fail to teach or suggest "two walls, formed of a substance exhibiting electrical conductivity, and positioned so as to sandwich said plasma generation region between them, in dimension of said center axis of said discharge electrode, for defining the scope of said plasma generation

region in said center axis dimension, wherein a substrate is located between said two walls; and second high-frequency electric power application means for applying high-frequency electric power to at least one of said two walls" as recited in claim 16.

For example, Watanabe merely teaches a method of producing a carbon film on a substrate. (Col. 1, lines 47-48) Accordingly, Watanabe merely teaches placing a substrate in a vacuum chamber having a graphite target electrode and an opposite electrode, evacuating the vacuum chamber to a predetermined pressure, introducing a gaseous mixture into the vacuum chamber to produce a predetermined pressure and gas mixture ratio, and releasing atomic particles from the graphite target electrode through a reactive sputtering process performed in the gaseous atmosphere, thereby depositing a carbon film on the substrate. (Col. 1, lines 49-61) Furthermore, Watanabe merely teaches that the substrates should be located at positions having a uniform potential, such as near a ground potential. (Col. 4, lines 1-4) As a result, Watanabe fails to teach or suggest a substrate being disposed between an anode or opposite wall electrode and a cathode electrode (Fig. 1, items 44, 46 and 64). Thus, Watanabe cannot suggest the features of the rejected claim.

Additionally, combining the teachings of Watanabe and Nakayama fails to overcome the deficiencies of Watanabe. Nakayama merely teaches a plasma treatment apparatus having an outer cylindrical electrode fitted over the chamber member and an inner cylindrical electrode disposed in the chamber member in concentric relationship to the outer cylindrical electrode. The outer cylindrical electrode is electrically connected to a high-frequency power supply, and the inner cylindrical electrode is grounded. The inner cylindrical electrode is in the form of a hollow cylinder with open upper and lower ends and has a plurality of small through holes. (Col. 6, line 67-Col. 7, line 7) Furthermore, Nakayama merely teaches that the outer cylindrical electrode and the inner cylindrical electrode serve to generate a plasma in



the apparatus. (Col. 7, lines 7-8) Therefore, Nakayama fails to teach or suggest the use of magnetic force lines. Accordingly, Nakayama cannot suggest the features of the rejected claim.

Thus, in Watanabe, a substrate is located at such a position that the effect of the anode or opposite wall electrode and the cathode electrode would be extremely small even if a cylindrical metal body is replaced with an outer cylindrical discharge electrode as disclosed in Nakayama. Therefore, the combined teachings of Watanabe and Nakayama fail to teach or suggest "two walls, formed of a substance exhibiting electrical conductivity, and positioned so as to sandwich said plasma generation region between them, in dimension of said center axis of said discharge electrode, for defining the scope of said plasma generation region in said center axis dimension, wherein a substrate is located between said two walls; and second high-frequency electric power application means for applying high-frequency electric power to at least one of said two walls" as recited in claim 16. Furthermore, the combined teachings of Watanabe and Nakayama fail to possess the advantage of the claimed invention in that the efficiency of plasma processing on the periphery and center region of a treatment substrate could be controlled so as to enhance the uniformity in the plasma processing on the surface of the treatment substrate.

Thus, claim 16 is patentable over the combined teachings of Watanabe and Nakayama.

## II. CONCLUSION

Based on the foregoing remarks, Applicants submit that claims 1-16 are patentable over the cited prior art. Applicants request allowance of the application with these claims. However, if the Examiner feels there is anything further necessary to place this application in

condition for allowance, Applicants request the Examiner to telephone Applicants' undersigned representative at the number below.

Respectfully submitted,



James A. Oliff  
Registration No. 27,075

Peter A. Shaddock  
Registration No. 44,331

JAO:PAS/dmg

OLIFF & BERRIDGE, PLC  
P.O. Box 19928  
Alexandria, Virginia 22320  
Telephone: (703) 836-6400